4. UNDERGROUND FACILITY ALTERNATIVES

The underground facility includes emplacement drifts, main drifts that provide access to emplacement drifts, a ventilation drift, ramps to the emplacement horizon, and shafts for ventilation. The initial configuration of the reference design being used for the Viability Assessment is described in Section 4.1. Only a portion of the reference design is constructed before waste emplacement operations begin. The construction costs of this portion are approximately 28 percent of the total MGR construction costs.

An alternative modular concept is described in Section 4.2. In order to reduce annual costs, the alternative concept defers construction of some of the initial main drifts and a ventilation shaft of the reference design. The first module of the alternative concept would incur annual costs smaller than the costs for the initial configuration of the reference facility. Total construction costs for the subsurface would, however, be increased by approximately $25M (98$). Although the order in which the main drifts are completed is different than for the reference design, it is expected that the modular concept will satisfy 10 CFR Part 60.41 in the same manner as the reference design, and would not introduce additional regulatory risk.

4.1 REFERENCE UNDERGROUND

The reference underground design is optimized to provide the full infrastructure and a small number of the emplacement drifts sufficient to obtain a license under 10 CFR Part 60. The rest of the emplacement drifts are constructed concurrently with operations to emplace waste in existing drifts.

The initial configuration of the reference underground design is illustrated in Figure 4-1. The configuration includes the main drifts, a ventilation drift, two ventilation shafts, and emplacement drifts. Approximately eight emplacement drifts are needed initially to support the assumed early receipt rates (the commercial SNF receipt rates for the first 5 years are 400, 600, 1200, 2000, and 3000 MTHM per year). The area containing emplacement drifts is isolated from the area in which emplacement drifts will be constructed so that there are two independent, isolated ventilation systems. Additional emplacement drifts are constructed concurrent with waste emplacement. Periodically, the barriers separating the emplacement and construction areas are relocated in order to make more drifts accessible for waste emplacement operations. Personnel can move through the isolation barriers if required by an emergency, but no routine passage of people or equipment through the barriers is planned.

The costs for the initial configuration are estimated to be $1,013M (98 $) or $1,226M (05$). The basis for these costs is provided in Appendix E. Construction of the initial configuration takes approximately 5 years.

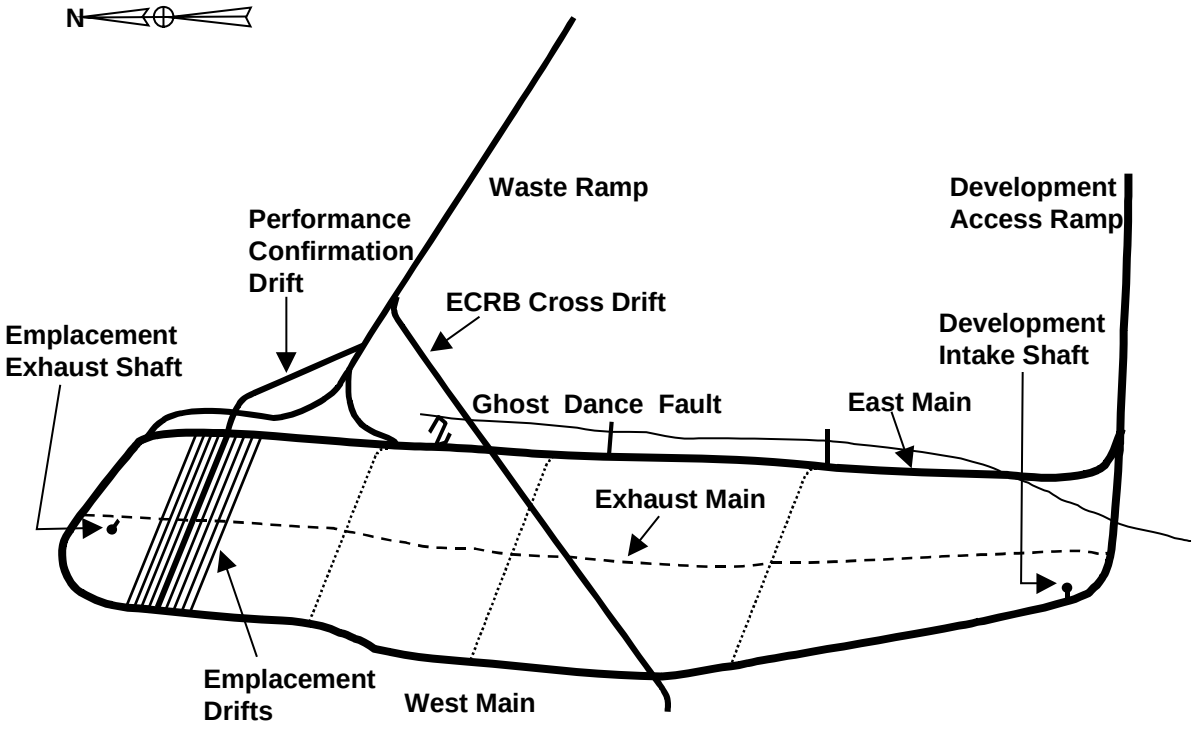

Figure 4-1. Initial Configuration of the Reference Underground Design

4.2 MODULAR APPROACH

The modular approach reduces annual costs by deferring construction of portions of the west main, the ventilation main, and one ventilation shaft of the reference design. The first module of the modular approach is illustrated in Figure 4-2. Concepts were developed for two different module capacities: 5,000 MTHM and 10,000 MTHM. The costs for the 5,000 MTHM module are estimated to be $704M (1998$) or $852M (05$). The 5,000 MTHM module was the only alternative used for formulating alternative program implementation scenarios since the costs of the 10,000 MTHM module are almost identical to the costs for the initial configuration of the reference design. The bases for these costs are provided in Appendix E. The construction of the 5,000 MTHM module is estimated to take at least 3 to 3.5 years.

The first module must be completed before emplacement can start. The 5,000 MTHM module would include approximately 12 emplacement drifts. Two of the drifts are installed for purposes other than emplacement. One drift provides an alternative path for emergency egress during module construction and during emplacement in the module. The other drift is a construction buffer so that buildout from the module can be conducted without disrupting the emplacement operations.

The capacity of the 5,000 MTHM module is sufficient to emplace both 5,000 MTHM of commercial SNF and 600 waste packages of DOE SNF and high-level waste without immobilized plutonium. Examples of potential waste emplacement options are shown in Table 4-1. The examples are based on the following assumptions: 60 commercial SNF waste packages

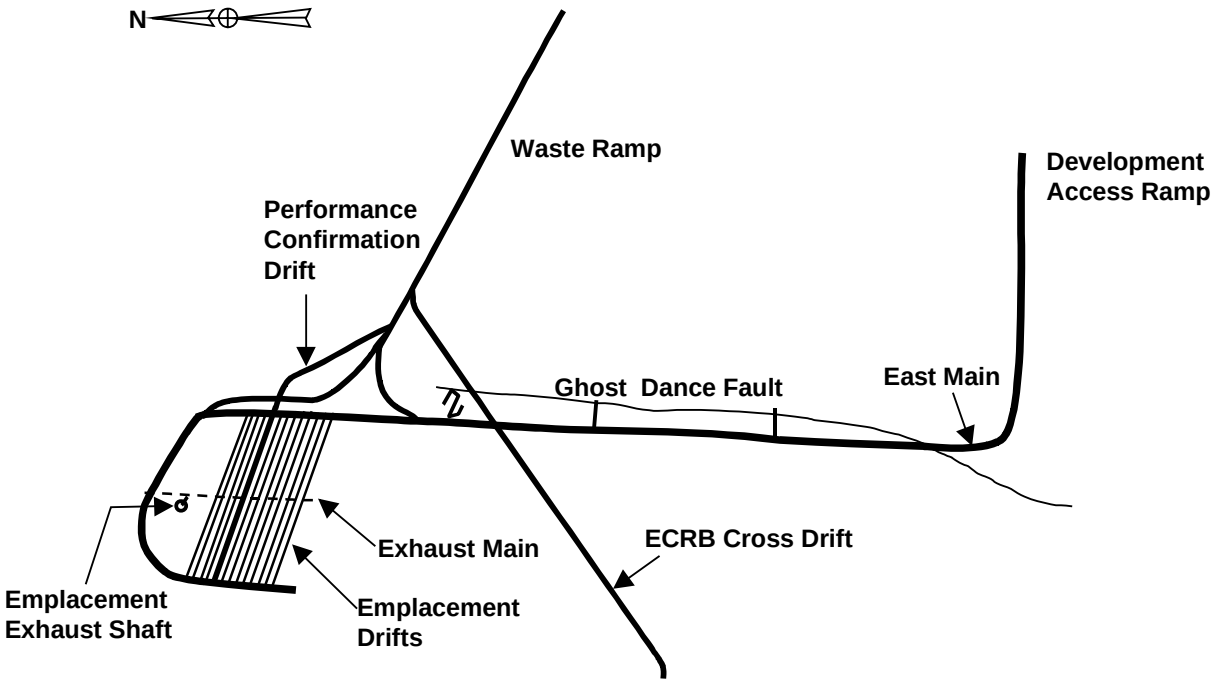

Figure 4-2. First Module of the Alternative Approach

Table 4-1. Example Waste Emplacement Options for the 5,000 Metric Tons of Heavy Metal Module

Example	Commercial SNF Waste Packages	Naval SNF Canisters	Small DOE SNF Canisters (1 DOE SNF canister codisposed with 5 canisters of high-level waste without immobilized plutonium)	Canisters with High-Level Waste and Immobilized Plutonium (2 canisters codisposed with 3 canisters of high-level waste without immobilized plutonium)	High-Level Waste Canisters (without immobilized plutonium)
1	510	90	300	600	2400
2	510	90	600	0	3000
3	90	90	780	600	5550
4	90	90	1080	0	6150

or waste packages with naval SNF can be emplaced in a drift; as many as 150 waste packages containing DOE SNF, high-level waste with immobilized plutonium, or high-level waste without immobilized plutonium can be placed in a drift; and a waste package containing DOE SNF, high-level waste with immobilized plutonium, or high-level waste without immobilized plutonium can be placed between two waste packages of commercial SNF or naval SNF.

The initial configuration of the second module includes the balance of the main drifts, ventilation drift, and 12 emplacement drifts, which is enough to support 3,000 MTHM per year operation during the first year. This module would be completed on a schedule consistent with achieving the desired level of annual costs after the first module has been completed. After this module is completed, the underground facility is operated in the same manner as the reference design. Emplacement of waste packages and construction of additional emplacement drifts are concurrent, and the emplacement and construction ventilation systems are isolated and independent.

The costs for the initial configuration of the second module are estimated to be $549M (98$) or $664M (05$). The basis for these costs is provided in Appendix E.